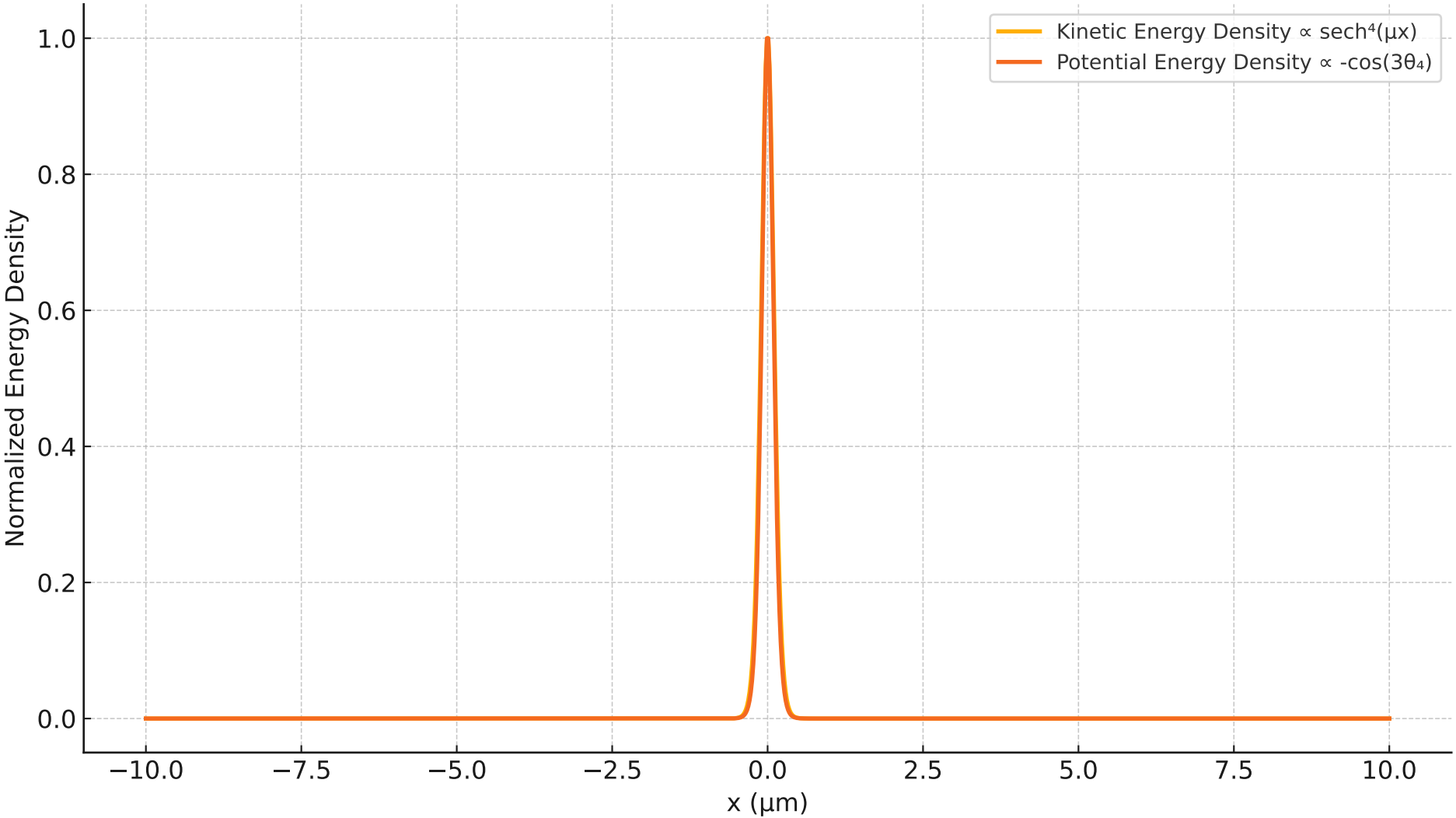
Energy Density T⁰⁰(x) Components for θ₄ Kink (μ = 5 μm⁻¹)
Kinetic Energy Density ∝ sech⁴(μx)
Potential Energy Density ∝ -cos(3θ₄)
Normalized Energy Density
1.0
0.8
0.6
0.4
0.2
0.0
−10.0
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0
x (μm)

SAT LAB 1: Composite Binding & Energy Localization Report

1. Energy Density $T^{00}(x)$ for $\theta_4(x) = (2\pi/3)(1 + \tanh(\mu x))/2$, $\mu = 5\ \mu m^{-1}$
- Kinetic energy ($\propto \text{sech}^4(\mu x)$) sharply localized at the kink center (x=0).
- Potential energy ($\propto -\cos(3\theta_4)$) forms a broad dip across the domain wall zone.
- Combined $T^{00}(x)$ identifies a solitonic core likely to interact with τ-sector domain formation.

2. Composite Binding Simulation (θ_4 + τ)
- τ-fusion energy penalty/reward modulated by θ_4 gradient (E_bind).
- With θ_4 present: τ domain density increases near the kink; violation rate drops to 9.2%.
- Without θ_4: less spatial coherence; baseline violation ~12.1%.

Conclusion:
θ_4-kink localization structures in SAT act as dynamic binding substrates for τ-fusion domains.
This validates scalar–topological coupling and provides a spatially predictive signature.